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EXAMINER

GAKH, YELENA G

ART UNIT

PAPER NUMBER

1743

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13

Please find below and/or attached an Office communication concerning this application or proceeding.

19-B

# Office Action Summary

Application No.

09/732,712

Applicant(s)

ITOU ET AL.

Examiner

Yelena G. Gakh, Ph.D.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 30 April 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-10,13-16 and 22 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10,13-16 and 22 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 11 December 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.  
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s) \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

### **DETAILED ACTION**

1. The Amendment filed on 04/30/03, is acknowledged. Claims 1-10, 13-16 and 22 are pending in the Application.

### ***Response to Amendment***

2. The following is an Office action based on the Amendment and the Applicants' arguments.

### ***Specification***

3. The specification is objected to as containing the subject matter, which is not written in such a clear and definite form as to allow any practitioner in the art to use the method in its most efficient way.

The specification discloses measuring a trace amount of water in purified ammonia using IR. While the goal of the method disclosed is measuring water present in the amounts of less than 10 ppm, 1 ppm and even less than 0.1 ppm, the reference gas used for such measurements is described as containing less than 10 ppm of water. It is not clear, how is it possible to quantitatively measure less than 1 ppm or even 0.1 ppm of water in analytical gas, when the reference gas may contain 10 and even 100 times more water than the analyte sample, especially the unknown amount of water in the reference gas? Also, according to Figure 1, the reference and the analyte samples are taken from two separate tanks, which may contain different amount of water, even if it less than 10 ppm each.

Further, the measurements are taken at certain wave numbers, corresponding to the ranges where water and ammonia signals are not overlapped. Since nothing is said about measuring (running) IR spectra for the reference and analyte samples first, it is not clear, if actually the real IR spectra are taken. If actual IR spectra are taken, no subtraction of the IR spectrum of the reference from the IR spectrum of the analyte is discussed, although using IR spectrum of the reference gas as the background is mentioned. Therefore, it is not clear, if such

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subtraction takes place, or not. If both IR spectra are measured, but no subtraction takes place, then it is also not clear, how correction for the huge signal of  $\text{NH}_3$  is done. It is not clear, how measuring the intensities of the signals at certain wavelengths, where there is no overlap between  $\text{NH}_3$  and water, e.g. where there is no signal of water at all, can provide information on water content?

*Claim Rejections - 35 USC § 112*

4. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-10, 13-16 and 22 are rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for the reference with exact amount of water, which should be much less than the water content of the analyte under measurement, does not reasonably provide enablement for the reference with the unknown amount of water, which also may exceed the water content of the analyte 10 and even 100 times. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to use the invention commensurate in scope with these claims. There is no way for anyone of ordinary skills in the art to measure amounts of water in the analyte sample in ranges of 1 ppm and even 0.1 ppm, using the reference with the amount of water 10 and even 100 times higher, especially when this amount is not known. Moreover, no one of ordinary skill in the art can measure the amount of water without obtaining full IR spectrum in the range of water absorbance, which is not recited in the claims. Also, since it is well known that water signal and  $\text{NH}_3$  signal overlap, the correction for  $\text{NH}_3$  signal should take place. Measuring intensity of the signal at wave number at which ammonia and water signals do not overlap does not make sense, if such wave number is not in the range of the water signal.

In claim 22 it is not clear, what is the difference between two gases – one used as a reference gas with an unknown amount of water < 10 ppm, and another being an analyte, obtained by heating liquefied ammonia with the unknown amount of water < 10 ppm? It is

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possible that heating liquefied ammonia will lead to increased amount of water content due to the water evaporation from the liquefied ammonia; however, it is not clear, how is it possible to measure one unknown amount of water using another unknown amount of water, especially when the samples are coming from different tanks (Figure 1), which by definition have different amount of water? This embodiment is not clear.

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-10, 13-16 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 22 recite, "measuring infrared absorption intensity of the reference gas". It is not clear how is it possible to measure infrared absorption intensity of the gas as a whole, when the gas comprises at least two components, ammonia and water, having different absorption intensities in the IR spectrum, depending on their content? The same problem exists for the expression "infrared absorption intensity of the sample". It is possible to measure "infrared absorption *spectrum* of the sample", but not the intensity, since intensity is the parameter of the signal, rather than the whole spectrum.

It is not clear from the claims, what is the difference between "a gaseous phase moiety of liquefied ammonia having a water concentration of 10 ppm or less" serving as a reference gas, and "ammonia as a sample"? Does the reference gas contain exact and known amount of water? If it does not contain exact and known amount of water, how can it be a reference gas? What is "ammonia as a sample"? Is it liquefied ammonia, or a gas?

The expression "measured intensity of the sample" in the last subparagraph is not clear. What does it mean? How the sample can have intensity? Is this a measured intensity of the absorption signal of water or something else? "The background absorption intensity" of which component is meant in the last sentence? Again, "intensity" refers to a certain signal. It cannot be referred to an entire spectrum.

Claim 22 is unclear as to what is being measured and what is being used as a reference gas. Claim 1 recites "introducing a gaseous phase moiety of liquefied ammonia having a water

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concentration of 10 ppm or less as a reference gas". Claim 22 recites, "measuring a water concentration in ammonia having a water concentration of 10 ppm or less", wherein as the first step the "gaseous phase moiety of liquefied ammonia" is introduced as a reference gas. How these two gases, the one that is measured and the one that is used as a reference gas, differ?

Since the term "a gaseous phase moiety of liquefied ammonia" is not defined in the specification in clear and unambiguous terms, and it is not clear, if this is a gas of crude ammonia, or refined gas, a gas containing a known amount of water, an unknown amount of water, a negligible amount of water, etc., the examiner will interpret this term in the broadest meaning, i.e. as any ammonia gas, obtained from liquefied ammonia, which contains less than 10ppm of water.

### ***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

9. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

10. **Claims 1-2, 5-10, 13 and 15-16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Kastle et al. (Microcontamination) and Girard et al. (ISSM), as presented by Wu (Anal. Chem.) (no Abstract or full paper of Kastle is available to the examiner at the present time).

Wu indicates, "Kastle et al. first demonstrated the detection of moisture in ammonia using a tunable lead salt diode laser and a 10-m multipass White cell. To avoid the effect of ammonia absorption, the strongest H<sub>2</sub>O absorption lines in the mid-infrared spectral region were not selected, but two H<sub>2</sub>O absorption lines at 1923.162 cm<sup>-1</sup> and 1922.342 cm<sup>-1</sup> were utilized, at which the absorption of NH<sub>3</sub> molecules were relatively small. As a result a detection limit of a few ppm was obtained" (page 3316, left column). The description does not contain any details of measurements; therefore, it is not clear, if any reference gas was used as a background.

Girard discloses measurements of water traces (in ppb) in NH<sub>3</sub> by NIR using purified NH<sub>3</sub> gas as a reference, subtracting its spectrum as a background. He also indicates that this method is used for determining remaining moisture in purified gases used in microelectronic manufacturing industry.

It would have been obvious for anyone of ordinary skill in the art to modify Kastle's method (in the case it does not comprise this step already) by using reference purified NH<sub>3</sub> gas in order to obtain the background spectrum, which is subtracted from the spectrum of the analyte, because it obviously improves the quality of the water content measurements due to corrections of the spectrum for the presence of remaining NH<sub>3</sub> signal.

11. **Claim 14** is rejected under 35 U.S.C. 103(a) as being unpatentable over Kastle and Girard, as applied to claims 1-2, 5-10, 13 and 15-16 above, and further in view of Muromura (US 4,075,306).

Kastle and Girard do not specify the way of drying ammonia.

Muromura teaches drying ammonia gas stream using sodium metal.

It would have been obvious for anyone of ordinary skills in the art to apply Kastle-Girard's method of measuring water trace in ammonia, which is dried according to Muromura's

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method, because the aim of Kastle-Girard's method is determining remaining moisture in dried ammonia.

***Response to Remarks and Arguments***

12. Regarding remarks on drawings: acceptance of the drawings by an examiner is not the same as their approval by a draftsman, since the examiner is looking for major drawbacks in the drawings, while the draftsman evaluate them more formally. That is why, while the examiner may accept drawings as not having any significant deficiencies, the draftsman may reject them on the formal basis.

Also, the examiner would like to notice, that she is she, rather than he, which presumably is clear from the name.

Regarding the Applicants' arguments, which will be considered in the same sequence as they are presented in the Remarks:

the question of the examiner, what is meant by the expression "measuring infrared absorption intensity at an infrared wave number", is not answered neither by the amendment, nor by the Applicants' explanations. As indicated in the rejection of the claims above, it is impossible to measure IR absorption intensity of a gas or a sample, if they are mixtures, which is the instant case. Water and ammonia give absorption signals in IR spectrum, the intensities of which are defined by the concentrations of water and ammonia in the gas and the sample, and which therefore should differ from each other, since water and ammonia do not comprise 1:1 mixture in the gas and the sample. The expression "infrared absorption intensity of the gas (or the sample)" is technically incorrect and does not make sense. What actually is measured for the reference and the sample is the IR absorption *spectrum*, rather than intensities.

The Applicants' arguments regarding the reference with less than 10 ppm of water, considered basically free of water, are not convincing not only in the light of the prior art of Wu, but in light of the Applicants' own disclosure. How can the sample with less than 1 ppm (even 0.1 ppm(!)) of water (claims 7 and 8) be measured with the reference with 10 ppm of water, especially when this amount of water is ignored in the reference as insignificant? Measuring the water content in the samples with the reference sample containing 10 and even 100 times more



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water than the samples themselves, and for which even this amount of water is considered to be insignificant and is ignored, does not have any technically reasonable basis.

Regarding claim 22 and non-clarity as to what is measured and what is considered a reference for the method recited in the claim: while the Applicants explained the difference between the reference and the sample with the amount of water to be measured, first, this difference is still not apparent, and second, the method itself remains non-understandable with the Applicants' explanations confusing and contradictory. Regarding the difference between the gaseous phase moiety of the liquefied ammonia and gas ammonia: it is known that ammonia has a boiling point at  $-33^{\circ}\text{C}$ , which makes it a gas at room temperature and atmospheric pressure. To liquefy ammonia high pressures are used. To evaporate ammonia it is enough to decrease the pressure. If both, the reference and the sample are introduced into the measuring cell under atmospheric pressure and room temperature, it is hard to understand, what should be the difference between these two, as gas is easily obtained from liquefied ammonia at atmospheric pressure? In other words, what should be the difference between two portions of ammonia from tanks 9 and 10 on Figure 1 before one of the portions is heated in the heater? Aren't they both gaseous phase moieties of the liquefied ammonia? Is this heating that makes them different?

Second, the method itself is not clear, and the Applicants' explanations are confusing. The Applicants indicate that the reference and the sample are purified to the same extent, which is confirmed by the recitation of the claim that both, the sample gas and the reference contain less than 10 ppm of water. This statement itself brings a question - if the reference sample with such amount of water is considered to be practically free of water, then why the sample with the same amount of water is not considered to be free of water and requires measurement of the water content? Second, if water quantity is about the same in both reference and the sample, with the water content in the reference unknown but basically neglected, then how is it possible to measure the water content in the sample with any accuracy? Further, the Applicants' statements on page 9 in two last paragraphs contradict each other. In the first paragraph the Applicants state that the reference gas and the sample under measurement are purified **to the same extent** ("or higher" without specifying how much higher). In the second paragraph they state that "the water concentration in the reference gas may be known or as small as **ignorable in comparison** with the water concentration in ammonia which is the object to be measured". So,

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are the sample and reference purified to the same extent (with less than 10 ppm of water), or the sample has much higher amount of water?

Since the rejections over the prior art are changed in the present Office action, no response to the remarks related to the prior art will be made, as the remarks are not relevant to the present rejections.

The arguments regarding purifying ammonia are not quite clear. What does not require purification – the reference gas? It is taken from one of two tanks, and therefore it is not clear, how the gas from one first tank must be purified while from the other – not?

Also, a discussion of a gas-liquid partition coefficient is irrelevant both to the Office action and the Applicants' amendment, as the gas-liquid partition coefficient is not the subject matter of the pending claims. Moreover, it is not clear, where the number 1/100 for this coefficient comes from and what it has to do with the claimed method?

### *Conclusion*

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yelena G. Gakh, Ph.D. whose telephone number is (703) 306-5906. The examiner can normally be reached on 9:30 am - 6:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jill A. Warden can be reached on (703) 308-4037. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.



Yelena G. Gakh

July 14, 2003